

Name_____

Date_____

AE Chemistry
Midterm Study Guide

Define Chemistry

Since chemistry studies matter what is the definition of matter.

What is the Law of Conservation of Matter?

What is energy, what are the two types of energy?

What is the Law of Conservation of Energy?

What are physical and chemical changes? Give some examples of each.

What are the four things that indicate a chemical change?

1.

3.

2.

4.

What are mixtures? What are the three types of mixtures and how do you tell them apart?

What is a pure substance? What are the two types of pure substances?

What are the properties of metal, nonmetals and metalloids?

What are the rows on the periodic table called? What are the columns called? How are elements sorted into rows and columns?

What is quantitative data, and what is qualitative data?

What are the scientific units of length, mass, and volume?

What are all the metric units that we have talked about thus far? Draw a chart that will help you remember them.

How would you convert between two units. Try the following (show all work)

25 cm = _____ km

50g = _____ mg

900 hm = _____ km

Define Accuracy and Precision.

Explain whether the following series of numbers are accurate, precise, or both.

Student's mass of object: 70.1 g 70.2 g 70.1 g 70.0 g

Actual mass of object; 70.0 g

What is the formula for percent error? If the volume of an object is actually 130 mL and its volume is measured to be 125 mL, what is the percent error?

Express the following numbers in scientific notation

_____ 8900 _____ 89000000 _____ 0.56 _____ 0.00000031

Write the following numbers as decimals

_____ 7.4×10^5 _____ 5.4×10^{-2} _____ 5.4×10^7

What are the two types of proportions we talked about? Describe them both in the space below.

For the following calculations:

- the volume of a cylinder is $\pi r^2 h$
- the volume of a cube is $L \times W \times H$.

The mass of a stone was found to be 90 g. The initial water level in a graduated cylinder was found to be 5.00 mL, and when the stone was placed inside it rose to 20.0 mL. What is the density of the stone?

A cylinder has diameter of 1.00 cm and a height of 90 cm. What is the density of the cylinder if it has a mass of 650 g?

What are the two laws John Dalton developed his atomic theory off of?

What are the five points of Dalton's atomic theory?

Which points of Dalton's atomic theory are incorrect by today's standards? **Explain why.**

Who discovered electrons and what did he use to do it?

What was done in Rutherford's gold foil experiment?

What were Rutherford's conclusions about the atom and its structure?

What are the three parts of the atom? Where in the atom are they found? What are the charges and masses of each?

Complete the table below:

Element	Atomic Number	Mass Number	Atomic Mass	Number of Protons	Number of Neutrons	Number of Electrons
Calcium						
Argon						
Fe ²⁺						

Define the term isotope.

The chlorine isotopes are listed below, what is the average atomic mass of chlorine?

Isotope	Atomic Mass (amu)	% Abundance
Chlorine-35	34.97	75.53
Chlorine-37	36.97	24.47

How many atoms are in 1 mole of a substance?

Complete the calculations below:

$$1.40 \text{ mol Al} = \underline{\quad? \quad} \text{ atoms Al}$$

$$2.1 \times 10^{23} \text{ atoms H} = \underline{\quad? \quad} \text{ mol H}$$

$$52 \text{ g Be} = \underline{\quad? \quad} \text{ mol Be}$$

$$0.75 \text{ mol S} = \underline{\quad? \quad} \text{ g S}$$

$$5.0 \times 10^{24} \text{ atoms Na} = \underline{\quad? \quad} \text{ g Na}$$

$$55 \text{ g Mn} = \underline{\quad? \quad} \text{ atoms Mn}$$

Define wavelength and frequency. How are they related to each other?

Briefly describe what Max Planck did in his research. What was his big conclusion on how energy behaves.

Define quantum(a) and photons.

Describe Neils Bohr's hydrogen atom in detail and how the electron behaves when energy is added to the atom.

Define excited state and ground state.

Why was Bohr's model wrong?

In the quantum model, what is an orbital? What kind of orbitals have we worked with? How many electrons do they hold and what are their shapes?

What are the principle and angular momentum quantum numbers?

Define Aufbau principle. Define Hund's rule. Define Pauli-Exclusion principle.

In the quantum model, can we precisely know the exact location of an electron in the quantum model?

What are the electrons in the outermost energy level called? Which orbitals are these electrons found in? What is the maximum number of these electrons an element can have?

For the elements below, provide the:

a. electron configuration notation

b. orbital notation

c. electron dot notation

N

Ca

Who made the first periodic table and how did he arrange it?

Who arranged the periodic table by atomic number in 1911?

What is periodicity?

What are alkali metals and their properties?

What are alkaline earth metals and their properties?

What are halogens and their properties?

What are noble gases and their properties?

Define the following atomic properties and explain their periodic properties.

Atomic Radius

Ionization Energy

Electronegativity

What are covalent bonds? What kinds of elements form covalent bonds?

What are ionic bonds? What kinds of elements form ionic bonds?

How do you tell if a bond is ionic, polar covalent, or nonpolar covalent?

What is bond energy?

What is the octet rule?

What are valence electrons?

How many valence electrons do oxygen, carbon, nitrogen, and phosphorous have? Draw their electron dot structures.

How many bonds do carbon, oxygen, nitrogen, and chlorine form? How unshared electron pairs does each atom have?

Draw Lewis structures for the following molecules



What are the structures of ionic compounds and how does their structure affect their properties?

What is VSEPR? Use this theory to predict the shapes of the 6 molecules above.

What are intermolecular forces? What are the different types of IMFs? How do they affect the properties of compounds and how do they compare to bonds?